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READING ACHIEVEMENT IN DISADVANTAGED CHILDREN AS A CONSEQUENCE OF NON VERBAL PERCEPTUAL TRAINING. FINAL TECHNICAL PROGRESS REPORT.

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The theoretical orientation based on perceptual development, proposed by Piaget in 1961, is the starting point of this investigation. According to Piaget, the perception of the young child is "centered" on dominant aspects of the field. With maturity, perception becomes "decentered" and progressively freed from the field. The visual training materials used in this experiment were designed with this principle in mind. The hypothesis that training in perceptual activity would improve reading skills was proposed. Sixty second-grade Negro children attending an inner city school in Rochester were matched in perceptual activity and reading achievement and split into a control group and an experimental group. The control group studied from a commercial reading program (The Bank Street Readers), while the experimental group was trained with the series of nonverbal perceptual materials noted above. The experimental group made significantly greater progress in word form and word recognition than the control group. However, with regard to "Meaning of Opposites", they did more poorly. This seems to indicate that noverbal perceptual training did not affect reading comprehension. References are included. (WL)

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Abstract

Two groups of inner city Negro children were matched for reading achievement and perceptual ability. The experimental group were trained with a series of non-verbal perceptual exercises for half an hour three times a week for a period of fifteen weeks. The control group met for a comparable amount of time but were trained with a commercial reading program (The Bank Street Readers). Results showed that the experimental group made significantly greater improvement on Word Form and Word Recognition than did the control groups. The results were interpreted as supporting a perceptual activity analysis of the perceptual process in reading.

Reading Achievement in Disadvantaged Children as a Consequence of Non Verbal Perceptual Training

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Reading is probably the most extensively researched problem in education so that a certain temerity is needed to initiate still another project in this domain. Despite the wealth of research, however, considerable disagreement remains as to the best methods of teaching reading and as to the major cause of reading retardation (which has been linked with everything from emotional disturbance to mixed dominance). The lack of clarity in the field may in part be due to the fact that most of the research appears to be pragmatic rather than guided by theoretical considerations. There are signs, however, that this situation is changing and that, as Holmes and Singer (1964) noted in their review of reading research, a new theoretical orientation is emerging in research on reading. Such a theoretical orientation, namely, the theory of perceptual development propounded by Piaget (1961) is the starting point for the study described here. Since the path from the theory to the actual research is somewhat winding, a brief recapitulation of the theory and of our previous research is probably in order.

According to Piaget, the perception of the young child is centered in the sense that it is caught and held by the dominant aspects of the visual field. In each case, the dominant aspects of the field are determined by Gestalt-like aspects of the configuration - such as continuity, proximity and closure - which Piaget terms field effects. With increasing age, however,

and the development of perceptual regulations (internalized actions) the child's perception becomes increasingly decentered in the sense that it is progressively freed from the constraints imposed by field effects. The perceptual activities which underlie decentration are multiple and include: visual exploration, transport (comparisons of visual stimuli separated by space or time), reorganization (as in figure ground-reversal), schematization (as in part-whole combinations) and, set or anticipation. While the Piagetian analysis of perception would seem to have relevance for a variety of perceptual phenomena, he and his colleagues have limited themselves almost exclusively to the study of visual illusions. For our part we have been concerned with testing out the Piagetian notions as these apply to the perception of figurative materials.

To this end we devised figurative tests for assessing the development of the different types of perceptual activities described by Piaget. Results of administering these tests to children at different age levels indicated that the various perceptual activities described by Piaget did indeed improve with age. For example, the tendencies to reverse figure and ground (Elkind and Scott, 1962) to schematize part-whole relations (Elkind, Koegler and Go, 1964) and to explore arrays in a systematic fashion (Elkind and Weiss, 1967) increase regularly with age during the early elementary school years. One by-product of these studies was the observation that children who performed well on the tests were also better readers than those children who had performed poorly. This suggested that there might be a relation between decentration activities and reading, and that the heretofore purely developmental research might have some practical applications.

In order to test the relation between decentration activities and reading, a variety of decentration and reading achievement tests were given to a large

group of elementary school children. A factor analysis of the results did indicate that a "decentration factor" was common to both the figural and verbal perceptual tasks (Elkind, Horn and Schneider, 1965). To insure that this common perceptual factor was not general intelligence in disguise, a second experiment was carried out with slow and average readers matched for IQ. Results showed that, in comparison with the average readers, the slow readers not only manifested less perceptual activity but also were less able to profit from perceptual training than were their average reading peers. (Elkind, Larsøn and Van Doorninck, 1965). A reasonable case could thus be made for perceptual activity playing at least a part in successful reading.

The rationale for the relation between perceptual activity and reading is straightforward. To read well it can be assumed that the child must be able to systematically explore or scan the printed page and to schematize the letters as words, and words as phrases and sentences. In addition, he must be able to recognize that one and the same letter can have different sounds in different contexts and that the same sound can be represented by different letters. The latter ability would seem to be comparable to the ability to recognize that one and the same contour line - when associated with different areas - can give rise to different forms as in reversible figures such as the Rubin vase-profile. Finally, in order to comprehend a text it would seem that the child would have to transport and anticipate meanings among words and sentences.

In view of the foregoing empirical and theoretical considerations, and in view of the finding that perceptual activity could be improved with training (Elkind, Koegler and Go, 1962), it seemed reasonable to suppose that training in perceptual activity might help to improve children's reading skills. To

test this hypothesis we devised a set of non-verbal exercises aimed at getting children to explore, reorganize, schematize, transport and anticipate perceptual configurations and arrays. The exercises were made non-verbal in the belief that this would force children to really exercise their perceptual activities without the crutch of verbalization. The exercises were also made non-verbal on the basis of our observation that teachers often talk too much or at too abstract a level and are consequently often "tuned out" by just those children most in need of instruction.

The exercises and a mimeographed workbook to accompany them were tried out in a summer reading program in Denver. Two, second grade classes were employed in the study. In each class the children were divided into experimental and control groups roughly matched for IQ, age, sex, and reading achievement (on an inventory constructed by Denver school personnel). The experimental groups were taught for an hour a week by one of us (DE). At the end of the summer session all the children were retested on the reading inventory. Results showed that children in the experimental groups made significantly more improvement than did the children in the control groups.

From an experimental point of view, however, the foregoing study had one major defect which it seems to share with a good many investigations concerned with the effects of special instruction upon reading ability. This defect was that the control children remained in the classroom and were never seen by the experimenter. This lent the experimental groups an aura of selection and of being something special which may have increased their motivation, and hence, their performance, quite independently of any effects due to the training. The study proposed here is an attempt to replicate the pilot study in a more systematic and controlled fashion to determine whether in fact the non-verbal

exercises had the beneficial effect they seem to have had upon reading skill.

It should perhaps be said that we do not regard the proposed exercises as a total reading program nor as a panacea for all reading ills. On the contrary, we regard them as an adjunct to other methods which are necessarily verbal in nature. Ideally, of course, one would wish to provide individual diagnosis and teaching geared to the particular needs of a given child. It is probably fair to say, however, that we are far from that ideal and that for now and for a considerable time to come reading will continue to be taught on a group basis. Under the circumstances it seems reasonable to provide teachers with materials and procedures that they can use now and that require little in the way of special preparation or equipment. The non-verbal exercises described here have the advantage that they require little in the way of special training on the part of the teacher and nothing more than a blackboard and chalk in the way of equipment.

Method

Subjects

The original subjects for the study were sixty, 2nd grade Negro children attending school in the inner city of Rochester. These sixty were selected from a larger sample of 2nd graders who had been tested on individual tests of perceptual activity (The Picture Ambiguity Test or PAT; Elkind and Scott, 1962; Elkind, 1964; and The Picture Integration Test or PIT; Elkind, Koegler and Go, 1964) and on Form W of the California Achievement Tests (1957 ed; 1963 norms). Subjects were selected so as to form two groups matched for perceptual activity and for reading achievement. For reasons described later, only 29 of the control and 25 of the experimental subjects actually

completed the experiment. It is because of these lost subjects that the matching data, shown in Table 1, are not as consistent and close as they were initially. As examination of Table 1 reveals, however, the loss of subjects worked in favor of the control rather than the experimental subjects who as a group scored somewhat lower in most of the sub tests and significantly so on Word Form sub test of the California Achievement Test. Accordingly, any terminal superiority of experimental over control group would be in spite of an initial inequality that was not in their favor.

Insert Table 1 about here

Procedure

The experimental and control groups were each broken up into two teaching groups of fifteen children per group. Throughout the training sessions one of us (DE) served as the teacher while the other (JD) served as participant observer. Es met with each group for half an hour three times a week for a period of 15 weeks. The control groups met from 1:00 to 1:30 p.m. and from 1:30 p.m. to 2:00 p.m. The two experimental groups met from 2:00 p.m. to 2:30 p.m. and from 2:30 p.m. to 3:00 p.m.

For the control groups, The Bank Street readers (1966) were distributed to the children at the beginning of the class period and the half hour was spent in having each child read several paragraphs of a story. In addition, exercises provided in the teacher's handbook, were written on the blackboard and were used to teach vocabulary, grammar and comprehension. Over the 15 week session the control classes read through two of the readers (one first and one second grade reader).

In order to channel the motivation of the children and to maintain order, several devices were employed. At the beginning of the period children were appointed to various roles. Two children, a boy and a girl, were selected as

"choosers". These children sat beside E and took turns choosing the child who was to read. In addition one child was selected as "Keeper of the Place" and his job was to point out the sentences currently being read, to youngsters who had lost the place. Still another child was chosen as "The Helper" to aid the child who was reading when he ran into difficulty with a word or phrase. A different child was chosen as "Keeper of the page" and his job was to write the page currently being read upon the blackboard. Finally, one child was chosen as a "Shusher" to keep the other children quiet. Other youngsters were chosen to straighten the chairs, collect the books and clean the blackboards after the session was over. By providing children with these various functions it was possible to maintain the group at a reasonable noise and activity level and to keep the reading and the exercises going at a reasonable pace. Each child had at least one opportunity, and usually two, to read during the course of each session.

The experimental groups were trained with our non-verbal exercises which are described in detail elsewhere (Elkind) and will only be described in a general way here. During the first session the children were told "We are going to play a game in which no one talks. I will write something on the board and when you know the answer, raise your hand. I will point to the child who is to go to the board. Remember, no one is to talk. All right, watch me."

At this point E went to the blackboard and wrote out a simple exercise (the series ABCDE) and then turned to the children after drawing a line under the next position in the series. Most of the children got the idea and raised their hands. The non-verbal training was thus launched. Each session began with a simple exercise and progressed to more difficult ones. The exercises

included series of descending and ascending order and of increasing difficulty (ACEG_); anagrams SIT^{P}; scrambled words (LUBE =); symbolic transformations

SUN = ☼ ; SHOE SHOES; coding HTAENS 5432 = ____; and many variations of
MOON = TOP TOPS 123456
PIE ____

these and similar problems. About mid-way through the teaching sessions E chose children to come to the board and serve as teachers. The children enjoyed this and did not limit themselves to parroting exercises first employed by E. That is to say, most of them grasped the principles upon which the exercises were constructed and were able to create new ones of their own.

One other point should be made about the experimental groups. They spontaneously became competitive and this competitive spirit was channeled by having the boys compete against the girls. E drew 2 columns on the board and labelled one "Boys" and the other "Girls". Each time a boy completed an exercise correctly, E placed a 1 in the boys column and the same held true when a girl succeeded. Although E was sometimes accused of showing favoritism to the boys or girls, the competition seemed to enhance interest and to be, for the most part, constructive. Each child was given at least one opportunity to go to the board each day and most children had two opportunities during any given class period.

Treatment of Data

After the completion of the training, the subjects were retested on the individual tests of perceptual activity (the PIT and PAT) and group tested on the California (Form X). Difference scores based on the pre and post test scores were then tabulated for the perceptual tests and for various sub tests of reading achievement from the California. Differences between the mean

difference scores for experimental and control groups were tested by the t test procedure.

Results

Because of moves, illness and incorrigibility not all the children who began as participants in the study remained to the end. There was one loss from the control group and five losses from the experimental group. Accordingly all comparisons are based on the 29 control and 25 experimental subjects who completed the experiment. Results of the t tests for the various pre and post test difference scores for experimental and control groups are shown in Table 2.

Insert Table 2 about here

As Table 2 indicates, there were 3 significant t tests for differences between experimental and control groups. In each case the higher mean score was made by the experimental groups. Tests on which the experimental group made significantly greater improvement than the control groups were the Picture Integration Test (PIT), Word Recognition and Word Form. In addition the differences between experimental and control groups on the PAT and the Picture Association Test again favored the experimental groups but did not reach statistical significance. Just the reverse held true for the Meaning of Opposites Test wherein the difference was in favor of the control groups but again did not reach statistical significance.

Discussion

Results of the present experiment suggest that non-verbal training in perceptual activity had a greater effect upon certain aspects of reading

achievement than did the more usual type of reading instruction. Before interpreting this finding, however, it might be well to make several general remarks about the experiment as a whole both to further clarify the context of the experiment and to answer possible objections.

First of all it must be said that the investigation labored under several, unforseen, handicaps. One of these handicaps was our inexperience with inner city, Negro children. Of necessity, there was a period of adjustment. It took time, to illustrate, for us to adapt to the level of activity and noise that was appropriate for these children. It took time, moreover, to realize that apparently aggressive physical contact, such as hitting, pinching, tapping, was not primarily aggressive but rather an accepted mode of interpersonal interaction. For their part, the children put us to the test continually during the first sessions to see how much they could get away with and what sort of punishment we would mete out. When a child did get out of hand we found that having him or her stand in the corner was sufficient as an inducement to regain self control.

As it turned out, we had fewer discipline problems in the two control groups than we did in the two experimental groups. This was the result of two factors. For one, by chance we got three boys in the experimental group who had been recognized discipline problems prior to the experiment and whom we eventually had to drop from the class because they were so disruptive. In addition, the experimental groups were made up of children from different classrooms so that there tended to be some initial cliquishness. The control groups, on the other hand, were in each case all from the same classroom.

A second handicap, which again affected the experimental subjects more than the controls, was that we met in the afternoons. For administrative

reasons we taught the two control groups first (i.e. from 1:00 to 1:30 and from 1:30 to 2:00 p.m. respectively) and the experimental groups second (i.e. from 2:00 to 2:30 and from 2:30 to 3:00). We soon discovered that some of the children had probably eaten little or no lunch so that by the end of the day stomach's were rumbly and children were restless. This situation was in part attributable to the fact that the school had no lunch room and that all youngsters went home at noon. Since many of the mothers work, the children had to find their own food and this was often little more than a candy bar.

Still a third handicap, which affected all groups, was that the training took place in a room other than the homeroom. It soon became apparent that any transition, particularly the move from one classroom to another, was disruptive. It always took the children some moments to quiet down after having been up and walking (or running!) in the halls. Since we only had a half an hour a day, the time spent in getting settled and "warming up" was relatively large.

Despite these handicaps, which on the whole seemed more detrimental to the experimental than to the control groups, all the children did make improvement and particularly the experimental groups. It might be argued, however, that the improvement made was a function of experimenter bias (Rosenthal; 1966) and expectation rather than as a result of the teaching per se. While this is a possibility, since the same experimenter taught all groups and knew whether they were experimental or control, the findings speak against such an interpretation. While the experimental groups did do better on some aspects of reading achievement, they did not do better on all aspects. Indeed with regard to "Meaning of Opposites" they did more poorly than the

controls. It would be hard to reconcile this particular difference with the charge of experimenter bias since if that were operative experimental children would be expected to perform at a higher level on all counts. Accordingly, while the possibility of experimenter bias was certainly present in this experiment the results are not consistent with such an explanation.

What do these findings mean, then, with respect to reading achievement and perceptual activity? For one thing, they seem to support our theoretical analysis of what is involved in this relationship. Practice in visual exploration, schematization, reorganization, transport and anticipation clearly improved the performance of the experimental group on the recognition of words and word forms to a significantly greater extent than was true for the control subjects. That such training did not differentially affect reading comprehension was to be expected since the exercises were not designed to alter this aspect of reading achievement. In the case of the Meaning of Opposites Test wherein the experimental subjects did more poorly than the controls, an artifact may have played its part. Since many of the non-verbal exercises resembled some of the items on this sub test, but had to do with differences and similarities, there may have been some inappropriate generalization to the test items. This possibility needs to be tested in our subsequent research. In general, however, by training children in the processes which we regard as basic to certain aspects of reading achievement, we have improved performance on these aspects and this, in some degree, argues for the validity of the analysis.

It should be said, in closing, that while the use of classroom teaching as an experimental training technique has many drawbacks, it also has special virtues. Not the least of these is the opportunity to observe the role of

group processes in learning - something which is not often possible when children are seen and trained individually. Although we lack a model or a language for describing these group factors, their potency can hardly be denied. We were repeatedly impressed with the difference in the approach to learning of our several training groups. One was a cohesive group with the children accepting and reinforcing one another. Another group was fragmented with several cliques and isolates sniping at one another. Such group espirit or lack of it, is clearly important in the learning activity of any individual within the group. This view is supported by the findings of the recent Campbell and Coleman (1966) report which suggests that the single most important factor in school achievement is neither teacher nor facilities but rather the educational background of the classroom group. Teaching in a classroom setting is one way in which to explore the role of such group factors in learning.

The use of classroom teaching as an experimental training device has other virtues as well. It brings psychological research into closer alignment with real educational problems. After teaching in a classroom, one can never again be glib about the applicability of learning principles, derived from subjects working in isolation, to learning in the group situation. Learning in groups is different than learning alone and psychologists interested in the educational implications of their work would be well advised to spend a semester teaching in the public schools. For our part, despite the trials and strains, we found the experience wonderfully rewarding and revealing and hope to continue to use classroom teaching as an experimental training device.

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Footnote

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Table 1

Pre-training mean scores and t tests for

Experimental[a] and Control Groups[b]

Test

N	Group	P.I.T.	P.A.T.	W. Form	W. Recog.	M. Opp.	Pict. Ass.	R. Comp.	Calif. Total *
29	Control	10.48	8.74	21.66	15.97	7.56	10.86	8.14	2.08
25	Exp	9.08	9.02	19.08	14.72	8.84	10.56	7.4	1.92
	t	1.53	.35	2.32*	1.30	1.60	.39	.73	.11

[a]Mean age (in mos.) = 96.5

[b]Mean age (in mos.) = 97.0

*Significant at .05 level (two tailed test)

Table 2

Post test Mean Difference Scores and t tests for

Experimental and Control Groups

N	Group	Test P.I.T.	P.A.T.	W. Form	W. Recog.	M. Opp.	Pict. Ass.	R. Comp.	Calif. Total *
29	Control	.31	3.41	.24	.57	1.62	.93	1.41	.21
25	Exp.	3.64	4.78	2.52	2.44	.28	1.88	1.68	.36
	t	1.96*	1.40	2.40*	2.64*	1.61	1.64	.38	.11

*Significant at .05 level (two tailed test)